Resilience in the Third Year of Medical School: A Prospective Study of the Associations Between Stressful Events Occurring During Clinical Rotations and Student Well-Being

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Abstract

Purpose
In the third year of medical school students are exposed to many stressful and potentially traumatic events, including witnessing patient suffering or death, personal mistreatment, and poor role modeling by physicians. These experiences may explain increases in anxiety and depression during medical school. However, to date this has not been studied.

Method
The present study prospectively measured stressful clerkship events occurring during the 2006–2007 academic year in third-year medical students of the Mount Sinai School of Medicine (n = 125), using surveys completed monthly. Students labeled stressful events traumatic if they met the trauma criteria of the *Diagnostic and Statistical Manual of Mental Disorders*, fourth edition. The authors measured anxiety, depression, and posttraumatic stress symptoms at the beginning and end of the year and twice during the year. At year's end they also measured students' personal growth.

Results
Class participation varied from 106 (85%) at baseline to 82 (66%) at endpoint. Most students (101; 81%) completed at least one monthly survey. Many students reported exposure to trauma as well as personal mistreatment and poor role modeling by superiors. Trauma exposure was positively associated with personal growth at year's end. In contrast, exposure to other stressful events was positively associated with endpoint levels of depression and other stress symptoms.

Conclusions
Trauma exposure was common but not associated with poor outcomes by year's end, which suggests that students were resilient. Nonetheless, unprofessional behavior by resident and attending physicians might have adverse effects on the well-being of students.

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In the third year of medical school, students transition from classroom learning to patient care. Third-year medical students, who may have no prior exposure to death, are routinely exposed to severely ill and dying patients during their clerkships.[1,2] They may also experience personal mistreatment: as many as 80% of graduating medical students report having been belittled, verbally abused, or discriminated against by superiors.[3,4] In addition, students sometimes observe physicians behaving unprofessionally towards patients, and they may become disillusioned about their chosen profession as a result.[4–6] Consequently, the third year of medical school may be the most challenging time for many students.[7,8]

Given the prevalence of stressful events on clinical rotations, it is perhaps not surprising that some medical students develop symptoms of depression and anxiety during their training.[9–11] However, few studies have focused on students' psychological well-being during the third year. Fewer still have investigated the direct emotional impact of stressful event exposure. For instance, medical educators do not know whether witnessing death on the wards can lead to symptoms of posttraumatic stress, as it can outside of the hospital setting.[12] Similarly, few studies have reported the impact of mistreatment by superiors on student well-being.[13–15] Finally, the psychological effects of observing poor role modeling by physician superiors are unknown. The present study aimed (1) to prospectively measure stressful events medical students encounter during their first year on clinical rotations and (2) to investigate both the acute and cumulative impact of these events on students' psychological well-being.

Some traits and behaviors are known to possibly influence psychological well-being during medical school. Medical students who are neurotic, introverted, and conscientious are especially at risk for experiencing stress during medical school.[16] Maladaptive coping styles such as avoidance, venting, and wishful thinking can increase student anxiety and depression, whereas adaptive coping styles (including problem solving and cognitive reframing) may help buffer the stress of medical school.[17–19] Studies outside of the medical school context have identified additional resilience factors (e.g., religious faith, social support, and optimism) that may mitigate the effects of stressful events on well-being.[20] This study also aimed to identify individual factors conferring risk

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for, or resilience to, the effects of stressful event exposure on student well-being.

Method

Setting

We conducted the study at the Mount Sinai School of Medicine. Participants comprised the 125 students of the Class of 2008 entering the third year of medical school. This consists of eight rotations at Mount Sinai Hospital and affiliated health centers: Internal Medicine (12 weeks), Surgery (including Anesthesia; 9 weeks), Obstetrics–Gynecology (6 weeks), Pediatrics (6 weeks), Family Medicine (4 weeks), Neurology (4 weeks), and Psychiatry (4 weeks).

Timeline

The study spanned the 2006–2007 academic year (Table 1). We told students that the purpose of the research was to determine the effects of stressful events occurring during clinical clerkships on mental health. We measured psychological well-being at four time points: baseline (June 2006), first quarter (November 2006), second quarter (March 2007), and endpoint (July 2007). From July 2006 to June 2007, students completed monthly surveys about stressful events occurring on the wards. At baseline, students also completed measures of individual risk and resilience factors. At endpoint, we repeated these measures and also assessed personal growth.

Design

Mount Sinai's institutional review board granted study approval. All participants provided written informed consent. They completed measures anonymously using student-selected identification numbers. We distributed hard copy questionnaires pertaining to psychological well-being and risk and resilience factors during classwide lectures, and students returned them in anonymous drop boxes. Students also had the option to complete these questionnaires online via www.surveymonkey.com.

At the beginning of each month, one of us (M.H.) sent all students the monthly surveys via an anonymous e-mail system and reminded them to return the surveys at the end of the month. This anonymous e-mail system allowed students to return surveys confidentially. We paid students $40 per completed monthly survey.

Measures

Psychological well-being. We used the Beck Anxiety Inventory (BAI) to measure anxiety.[21] It shows good psychometric properties in several populations.[22] Total scores signify very low (0–21), moderate (22–35), or severe anxiety (36–63).[21]

We used the Beck Depression Inventory, version 2 (BDI-II), to measure depression.[23] Previous research has demonstrated its reliability and validity in a number of populations including medical students.[24,25] Total scores signify minimal (0–13), mild (14–19), moderate (20–28), or severe depression (29–63).[23]

We used the Posttraumatic Stress Disorder (PTSD) Checklist, civilian version (PCL-C), to measure problems and complaints that people may have in response to stressful events.[26] Reliability and validity are considered to be excellent.[27–29] Scores range from 17 to 85. In previous research, the PCL-C has been used to diagnose clinically significant PTSD using a >50 cutoff score.[30,31]

Monthly surveys. We asked students to report all clerkship-related events they found distressing within a certain month. In particular, we asked students to report events involving patient suffering, personal mistreatment by superiors, and poor role modeling in patient care. Each survey included space for students to describe, in as many words as they chose, each event they reported. We also asked students to label events as traumatic (1) if they experienced, witnessed, or were confronted with an event that involved actual or threatened death or serious injury or a threat to the physical integrity of themselves or others, and (2) if the event elicited intense fear, helplessness, or horror. These are PTSD diagnostic criteria A1 and A2 in the *Diagnostic and Statistical Manual of Mental Disorders*, fourth edition (DSM-IV).[12]

Students rated the acute emotional impact of all events using 10-point linear scales (1 = least, 10 = most) of fear, helplessness, horror, and sadness. Students also reported whether and with whom they discussed the event, and how much support they felt others provided in relation to the event (1 = none, 10 = an ideal amount). Where applicable, students reported the professional position of the person responsible for the event (e.g., attending, resident).

Table 1

Time Line and Response Rate of Instruments Measuring the Associations Between Stressful Events During Third-Year Clinical Rotations and End-of-Year Student Well-Being in the Mount Sinai School of Medicine Class of 2008

Month of study	Measures taken	Number of respondents (% of 125 students)
June 2006	Psychological well-being	106 (85)
	Risk and resilience factors	106 (85)
July 2006	Monthly survey 1	92 (74)
August 2006	Monthly survey 2	88 (70)
September 2006	Monthly survey 3	84 (67)
October 2006	Monthly survey 4	86 (69)
November 2006	Psychological well-being	81 (65)
	Monthly survey 5	79 (63)
December 2006	Monthly survey 6	79 (63)
January 2007	Monthly survey 7	69 (55)
February 2007	Monthly survey 8	72 (58)
March 2007	Psychological well-being	81 (65)
	Monthly survey 9	72 (58)
April 2007	Monthly survey 10	74 (59)
May 2007	Monthly survey 11	73 (58)
June 2007	Monthly survey 12	69 (55)
July 2007	Psychological well-being	82 (66)
	Risk and resilience factors	82 (66)
	Personal growth	82 (66)

We also asked students to report distressing personal events. Students reported only two such events throughout the year. Because of the small number, we excluded these events from our data analyses.

Risk and resilience factors. We selected several commonly used questionnaires to measure risk and resilience factors that might be associated with anxiety, depression, and posttraumatic stress symptoms at the end of the year: the Brief Coping Scale (BCOPE), the Religious Coping Scale (RCOPE), the Revised Life Orientation Test (LOT-R), the Connor Davidson Resilience Scale (CD-RISC), the Social Adjustment Scale, Self-Report version (SAS-SR), the NEO Five-Factor Inventory (NEO-FFI), and the Childhood Trauma Questionnaire (CTQ). We chose these because all have good psychometric properties and have been well validated in appropriate populations. A brief description of each of these questionnaires follows.

The BCOPE measures several types of commonly used coping behaviors.[32] Adaptive forms of coping include active coping, seeking emotional or instrumental support, positive reframing, humor, and acceptance. Maladaptive forms of coping include self-blame, denial, substance use, venting, and behavioral disengagement. We summed six adaptive coping forms into one positive coping score (BCOPE+; range 12–42, where a higher score indicates the use of more positive coping skills), and we summed five maladaptive coping forms into one negative coping score (BCOPE−; range 10–40, where a higher score indicates the use of more negative coping skills).[33]

The RCOPE evaluates the use of religion in dealing with stressful events.[34] Only those who believe in God or a higher power complete this scale. It measures adaptive coping (use of God for support, partnership, and guidance; items summed into RCOPE+; range 0–9, where a higher number represents a greater use of religious adaptive coping skills) and maladaptive coping (belief that God is punishing or abandoning; items summed into RCOPE−; range 0–9, where a higher number indicates a greater use of maladaptive religious coping skills).

The LOT-R measures expectancies for life outcomes.[35] Scores range from 0 to 24. Individuals with higher scores are thought to have a more positive outlook on life. The CD-RISC is a general measure of resilience to stress. Scores range from 0 to 100. Individuals with higher scores are thought to be more resilient.[36] The SAS-SR assesses functioning in social roles.[37,38] We used the Student and Leisure sections. Scores range from 1 (best functioning) to 5 (worst functioning). The NEO-FFI is a 60-item assessment of personality. Scores on each of the five subscales (Neuroticism, Extroversion, Openness to Experience, Conscientiousness, and Agreeableness) range from 0 to 48, with higher scores indicating higher degrees of neuroticism, extroversion, etc.[39] The CTQ measures childhood abuse and neglect.[40] Scores range from 5 to 125, with higher scores indicating more trauma.

Personal growth. The Posttraumatic Growth Inventory (PGI) measures dimensions of personal growth after stressful life events, including reordering one's priorities, having a sense of new meaning in or renewed appreciation of life, having a sense of increased personal strength, and feeling closer to others.[41] When students completed this questionnaire at year's end, we asked them to specifically consider growth experienced at the end of their third year, thinking back on their experiences throughout the entire year. Scores range from 0 to 105, with higher scores representing more growth.

Data verification

Event coding. On completion of the study, two of us (M.H. and M.a.h.R) independently coded each stressful event into one of four categories (student–patient interactions, physician–student interactions, physician–patient interactions, and other; see the descriptions below) on the basis of a perceived need to code events simply and objectively. We formulated the categories using experience from prior social interaction studies. Interrater reliability on event coding using these four categories was 88%. The two of us then reached consensus on the remaining events through verbal discussion. This approach yielded 385 student–patient interactions, 270 physician–student interactions, 154 physician–patient interactions, and 66 other events. Thus, we included a total of 875 events in the data analyses.

Student–patient interactions usually involved students witnessing patients die, suffer from serious illness, or undergo potentially life-threatening operations (257; 67%). In some student–patient interactions (85; 22%), students actively participated in stressful and/or potentially harmful medical interventions (e.g., chest compressions, manually ventilating patients, nasogastric tube insertions). Also included in this category were a small number of events in which patients were aggressive toward students (31; 8%) or in which students were exposed to potentially infectious bodily fluids (12; 3%). Physician–student interactions consisted of student mistreatment by physician superiors and, sometimes, by support staff. These events included rude or belittling comments, verbal abuse, and sexual harassment. Most interactions involved the student reporting the event directly (261; 97%). In some cases students reported seeing other students being mistreated (9; 3%). Physician–patient interactions primarily consisted of students observing unprofessional behavior by superiors toward patients, ranging from significant negligence and substandard care to making fun of patients (145; 94%). Also included in this category were a small number of events in which patients were aggressive toward physicians (9; 6%). Finally, other events represented events common to all types of schooling. Examples included students reporting exhaustion from hours worked, stress about assignments, anger about tuition costs, and interpersonal issues with classmates.

Trauma exposure. Students labeled 199 events (23% of 875) as traumatic using the DSM-IV PTSD diagnostic criteria A1 and A2 provided on the monthly surveys. After the completion of the study, we verified whether students labeled these events correctly in two ways.

First, we checked the event category (student–patient, physician–student, physician–patient, or other) as an indication of whether the events the students labeled traumatic did indeed involve experiencing, witnessing, or being confronted with an event that involved actual or threatened death or serious injury, or a threat to the physical integrity

of themselves or others (criterion A1). Most of the events students labeled traumatic (181; 91%) were, as expected, classified as stressful student–patient interactions. Most of the remaining traumatic events involved physician–student interactions (14; 7%); in all of these events, students reported that either physicians' poor care of patients had resulted in unnecessary and severe patient suffering or death, or violent patients had threatened the physical integrity of physicians. We categorized three student-labeled traumatic events (1.5%) as other. Finally, one event (0.5%) was a stressful physician–student interaction in which a student described being provoked, humiliated, and sexually harassed. Self-reported levels of fear, helplessness, and horror for this last event were all 10 out of 10. Thus, we concluded that student labeling was generally consistent with DSM-IV criterion A1.

Second, we checked whether events that students labeled traumatic did indeed elicit intense fear, helplessness, or horror (criterion A2). Of 199 student-labeled traumatic events, 173 (87%) involved levels of fear, helplessness, or horror of at least 6 (on a scale of 1–10). Using 7, 8, 9, or 10 as a cutoff, these numbers dropped to 158 (79%), 123 (62%), 79 (40%), and 36 (18%), respectively. Given that a level of fear, helplessness, or horror of at least 6 may be considered to reflect an intense acute emotional impact, we concluded that student labeling was generally consistent with DSM-IV criterion A2.

Of note, most other events reported by students, albeit not considered traumatic by them, were also highly stressful. Of these 676 events, 508 (75%) involved levels of fear, helplessness, or horror of at least 6, and 442 (65%), 327 (48%), 185 (27%), and 69 (10%) involved levels of fear, helplessness, or horror of at least 7, 8, 9, or 10, respectively. While 203 (30%) were student–patient interactions considered stressful but not traumatic, most of these events involved stressful physician–student interactions (270 or 40%, reflecting physicians mistreating students) or stressful physician–patient interactions (142, or 21%, reflecting physicians being poor role models for patient care). The remaining events (61; 9%) were categorized as other events.

Statistical analyses

We first analyzed baseline gender differences in BAI, BDI-II, and PCL-C scores using between-groups *t* tests. Then, to avoid having to omit data from participants with missing values at subsequent time points, we analyzed changes in scores over time using mixed models.[42] We considered the variable *time* as a fixed effect with four levels (baseline, first quarter, second quarter, endpoint) and a heterogeneous autoregressive covariance structure. We considered the intercept as a random effect with an unstructured covariance structure. We used a maximum likelihood method of estimating the covariance parameters and the between-within method for computing the denominator degrees of freedom for the tests of fixed effects.

We analyzed self-reported levels of fear, helplessness, horror, sadness, and perceived support across the four different event categories using mixed models that considered the variable *trauma* as a fixed effect with two levels (yes, no). Further model specifications were as above.

We analyzed changes in fear, helplessness, horror, sadness, and perceived support levels over time using mixed models that considered the variables *trauma* (yes, no), *semester* (first, second), and their interaction. We tested for changes in event reporting in the first semester versus the second semester using a test for difference between proportions (two-proportion z-test).

We tested associations between stressful event exposure (traumatic versus nontraumatic) during the year and BAI, BDI-II, PCL-C, and PGI scores (i.e., mental health outcomes) at the end of the year using linear multivariate regressions. Models controlled for baseline scores, where applicable. We first tested associations between risk and resilience factors and endpoint BAI, BDI-II, PCL-C, and PGI scores using individual univariate regressions, and then we retested these associations using stepwise linear regressions that included only those risk and resilience factors that were significant in the univariate regressions. All stepwise regressions used $P < .10$ as a cutoff for entry into the model and $P \geq .05$ as a cutoff for exit from the model.

We deemed outcomes of statistical tests significant if $P < .05$, unless otherwise indicated. Post hoc simple contrasts of significant omnibus F tests performed in the mixed-model analyses were Tukey corrected for multiple comparisons where applicable. We performed all analyses using SAS 9.1.3 for Windows (SAS Institute, Cary, North Carolina). Further details are provided in the Results section.

Results

Participants

The class of 2008 consisted of 125 students, of whom 106 (85%) completed baseline measures in June 2006 and 101 (81%) completed at least one monthly survey during the course of the 2006–2007 academic year. The percentage of students completing monthly surveys decreased from 93 (74%) in July 2006 to 69 (55%) in June 2007. Seventy-three students (58%) submitted at least 6 of 12 surveys, and 34 students (27%) submitted all 12 surveys. Only five students (4%) completed just one monthly survey. On average, students (excluding those who did not complete any monthly surveys) completed 9.3 monthly surveys. A majority of students (82; 66%) completed endpoint measures in July 2007. Please see Table 1 for an overview of the number of respondents in each month.

Baseline participant characteristics

Demographic information of the 101 students who completed baseline data and at least one monthly survey is summarized in Table 2. The results below pertain to these students only. Mean ± standard deviation (SD) BAI scores were 7.2 ± 6.3 at baseline. Women had higher BAI scores (9.3 ± 6.5) than men (4.7 ± 5.0, $P < .0003$). Mean ± SD BDI-II scores were 6.0 ± 6.4 at baseline. There was no gender difference ($P = .55$). Mean ± SD PCL-C scores were 23.3 ± 5.7 at baseline. There was no gender difference ($P = .39$). Please refer to Table 2 for a breakdown of BAI, BDI-II, and PCL-C scores per diagnostic group.

Changes in anxiety, depression, and posttraumatic stress throughout the year

Figure 1 depicts changes in BAI, BDI-II, and PCL-C scores over time. The findings, described in detail below, did

Table 2

Baseline Characteristics of 101 Students From the Mount Sinai School of Medicine Class of 2008, Who Participated in a Prospective Study of the Associations Between Stressful Events During Third-Year Clinical Rotations and End-of-Year Student Well-Being*

Variable	Number of respondents (% of 101 students)
Gender—female	54 (53)
Current anxiety level†	
Very low	97 (96)
Moderate	4 (4)
Severe	0 (0)
Current depression level‡	
Minimal	89 (88)
Mild	6 (6)
Moderate	5 (5)
Severe	1 (1)
Clinically relevant PTSD§	0 (0)

* There were 125 students in the class; 106 completed baseline measures, and 101 completed at least one monthly survey. The mean ± SD baseline age of the 100 participants who provided their age was 25.4 ± 2.2.

† Breakdown based on baseline Beck Anxiety Inventory (BAI) scores.

† Breakdown based on baseline Beck Depression Inventory, version 2 (BDI-II) scores.

§ PTSD, posttraumatic stress disorder; based on baseline Posttraumatic Stress Disorder Checklist, Civilian version (PCL-C) scores.

not change when we looked at gender as a possible moderator.

BAI. *Time* had no significant overall effect ($P = .07$) on BAI scores, suggesting that anxiety levels did not significantly change during the course of the year. Post hoc investigation of time-point by time-point differences confirmed this (all P values > 0.05). The percentage of students with moderate to severe anxiety on each of the four time points was 4%, 1%, 4%, and 1%. Please note that the total number of students on which these percentages are based changed from 101 at baseline to 82 at endpoint.

BDI-II. *Time* had a significant effect ($P < .0001$) on BDI-II scores. Post hoc tests showed that scores increased on average three points from baseline to the first quarter ($P < .0001$) but did not significantly change thereafter (first quarter versus second quarter: $P = .84$; second quarter versus endpoint: $P = .31$). Mean scores were two points higher at year's end than at baseline ($P < .007$).

The percentage of students with mild depression increased from 6% at baseline to 15% at the first quarter and then fell to 14% at the second quarter and 13% at endpoint. For moderate depression, these numbers were 5%, 6%, 3%, and 4%. For severe depression, these numbers, based on 101 students at baseline and 82 at endpoint, were 1%, 0%, 5%, and 1%.

PCL-C. *Time* had a significant effect ($P < .03$) on PCL-C scores. Post hoc testing showed that symptoms of posttraumatic stress increased slightly from baseline to the first quarter ($P < .05$), remained stable until the second quarter (first quarter versus second quarter: $P = .89$), and returned to baseline levels by year's end (baseline versus endpoint: $P = .69$). The percentage of students with PCL-C scores higher than the cutoff suggestive of clinically significant PTSD was 0%, 0%, 1%, and 0% on each of the four time points (with 101 students at baseline and 82 at endpoint). The one student who surpassed the PCL-C cutoff of 50 at the second quarter had, up to that time point, reported two events (both labeled nontraumatic). This person did not submit any further surveys or complete any endpoint measures.

Stressful event reporting

Trauma exposure. The mean number of traumatic events per student was 2.0 (range 0–11). During the course of the year, 63% of students experienced at least one traumatic event. The percentage of students reporting at least one traumatic event on a certain rotation was 48% for Internal Medicine, 40% for Surgery, 25% for Obstetrics–Gynecology, 19% for Neurology, 13% for Psychiatry, 5% for Pediatrics, and 2% for Family Medicine.

Other stressful events. The mean number of stressful events not considered traumatic was 6.7 per student (range 0–25). During the course of the year, 89% of students reported at least one such event. The percentage of students reporting at least one nontraumatic stressful event on a certain rotation was 76% for Internal Medicine, 72% for Surgery, 60% for Obstetrics–Gynecology, 46% for Neurology, 45% for Pediatrics, 32% for Psychiatry, and 31% for Family Medicine.

Given that nontraumatic events often involved stressful physician–student or stressful physician–patient interactions, we also analyzed their prevalence separately. The mean number of (nontraumatic) stressful physician–student and physician–patient interactions was 3.2 per student (range 0–15). During the year, 79% of students reported at least one of these types of interactions.

Acute emotional impact of events

As expected, traumatic events were associated with more self-reported fear ($P < .0001$), helplessness ($P < .03$), and horror ($P < .0001$) than nontraumatic events (Table 3). Levels of sadness were also higher ($P < .0001$). Gender did not influence these findings (data not shown).

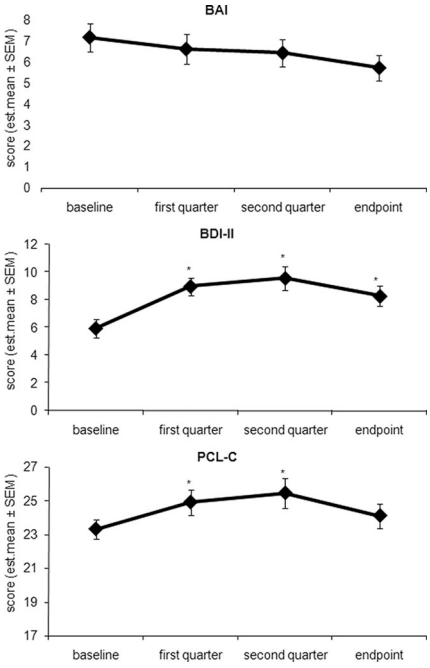

Figure 1 Changes in anxiety, depression, and posttraumatic stress experienced by third-year medical students in the Mount Sinai School of Medicine Class of 2008 during the course of the 2006–2007 academic year. The authors administered these three measures at four points (June 2006, November 2006, March 2007, and July 2007—Table 1), and 82 to 106 (66%–85%) of the 125 students completed them. SEM, standard error of the mean; BAI, Beck Anxiety Inventory; BDI-II, Beck Depression Inventory, version 2; PCL-C, Posttraumatic Stress Disorder Checklist, civilian version.

* Significantly different from baseline ($P < .05$).

Table 3

Acute Emotional Experience in Response to Stressful Events of 101 Students From the Mount Sinai School of Medicine Class of 2008, Who Participated in a Prospective Study of the Associations Between Stressful Events and Student Well-Being During the Clinical Year*

	Mean [standard error of the mean]			
Type of event	Fear	Helplessness	Horror	Sadness
Traumatic	5.0 [0.2]	6.8 [0.2]	5.6 [0.3]	6.1 [0.2]
Other stressful (nontraumatic)	3.5 [0.2]	6.4 [0.1]	4.0 [0.2]	5.1 [0.2]

* There were 125 students in the class; 106 completed baseline measures, and 101 completed at least one monthly survey.

Perceived support

Students were equally likely to talk to someone after a traumatic event (83% of events) than after a nontraumatic event (86% of events); however, they felt more supported by others when experiencing traumatic events (5.8 ± 0.3) than when experiencing nontraumatic events (4.3 ± 0.2; $P < .0001$). Perceived levels of support were higher when students discussed events with team members (7.0 ± 0.3) than with friends, family, or romantic partners (3.3 ± 0.3, $P < .0001$).

Changes in event reporting and acute emotional impact over time

Students who returned monthly surveys reported fewer events as the year progressed. Overall, 91% reported at least one event in the first semester versus 78% in the second semester ($P < .006$). When divided into traumatic and nontraumatic events, we found that although the percentage of traumatic events reported decreased somewhat over time (first semester: 53%; second semester: 45%), the decrease was not significant ($P = .11$). On the other hand, the decrease in students reporting nontraumatic events was significant (first semester: 86%; second semester: 73%, $P < .02$). More specifically, the decrease was significant for the following rotations: Internal Medicine ($P < .008$), Pediatrics ($P < .02$), Family Medicine ($P < .0008$), and Psychiatry ($P < .0009$).

Overall, students felt less fear in second-semester events (3.1 ± 0.2) than in first-semester events (4.2 ± 0.2; $P < .0001$). Horror, helplessness, and sadness did not change over time ($P > .44$). Students felt less supported in the second semester (4.1 ± 0.2) than in the first semester (4.9 ± 0.2; $P < .0009$). The *semester*-by-*trauma* interaction was not significant.

Relation between stressful event exposure during the year and anxiety, depression, and posttraumatic stress at the end of the year

Table 4 summarizes the outcome of multivariate regressions used to find out whether event exposure during the course of the year was associated with endpoint BAI, BDI-II, and PCL-C scores (measuring anxiety, depression, and posttraumatic stress symptoms, respectively). Models included the number of traumatic events and the number of nontraumatic events as regressors and controlled for baseline BAI, BDI-II, or PCL-C scores.

Stressful event exposure during the year was not significantly associated with end-of-year BAI scores. Exposure to nontraumatic events (but not traumatic events) was positively associated with end-of-year BDI-II scores. Similarly, and somewhat surprisingly, exposure to events labeled as nontraumatic (rather than those labeled traumatic) was positively associated with endpoint PCL-C scores.

Identifying potential risk and resilience factors

Table 5 summarizes the outcomes of univariate regressions which were aimed at finding out which risk and resilience factors assessed at the beginning of the year, in addition to stressful event exposure during the year, contributed to anxiety, depression, and posttraumatic stress symptoms at the end of the year. Subsequent stepwise regression models included (1) baseline BAI, BDI-II, or PLC-C scores, (2) the number of traumatic events and the number of nontraumatic events, and (3) the risk and resilience factors identified as potentially relevant in the univariate regressions (e.g., baseline BCOPE−, RCOPE−, SAS-SR, NEO Neuroticism, and CTQ scores for the endpoint BAI analysis). Into each

Table 4

Association Between the Cumulative Number of Events Reported During the Year and Symptoms of Anxiety, Depression, and Stress at the End of the Year in the 82 Students From the Mount Sinai School of Medicine Class of 2008 Who Completed Endpoint Measures in a Prospective Study of the Associations Between Stressful Events and Student Well-Being During the Clinical Year*

	Endpoint BAI score		Endpoint BDI-II score		Endpoint PCL-C score	
Measure	B [SE]	*P* value	B [SE]	*P* value	B [SE]	*P* value
Baseline score†	0.62 [0.09]	**<.0001**	0.37 [0.10]	**<.0006**	0.30 [0.12]	**<.02**
Number of traumatic events	0.03 [0.03]	.34	0.02 [0.04]	.56	0.06 [0.04]	.14
Number of other stressful (non traumatic) events	0.02 [0.02]	.23	0.07 [0.02]	**<.002**	0.04 [0.02]	**<.05**

* There were 125 students in the class; 106 completed baseline measures, and 101 completed at least one monthly survey. These data represent outcomes of multivariate regressions. BAI, Beck Anxiety Inventory; BDI-II, Beck Depression Inventory, version 2; PCL-C, Posttraumatic Stress Disorder Checklist, Civilian version; B, standardized regression coefficient; SE, standard error. *P* values in bold are statistically significant.

† Baseline BAI, BDI-II, or PCL-C scores were controlled for when predicting endpoint BAI, BDI-II, and PCL-C scores, respectively.

Table 5

Univariate Regressions of Risk and Resilience Factors Assessed at the Beginning of the Year and Stressful Event Exposure During the Year on Symptoms of Anxiety, Depression, and Stress at the End of the Year Among the 82 Students From the Mount Sinai School of Medicine Class of 2008 Who Completed Endpoint Measures in a Prospective Study of the Associations Between Stressful Events and Student Well-Being During the Clinical Year*

	Endpoint BAI score		Endpoint BDI-II score		Endpoint PCL-C score	
Measures	B [SE]	*P* value	B [SE]	*P* value	B [SE]	*P* value
Baseline score†	0.68 [0.09]	**<.0001**	0.49 [0.10]	**<.0001**	0.43 [0.11]	**<.0003**
Traumatic events	0.10 [0.04]	**<.02**	0.07 [0.04]	.09	0.11 [0.04]	**<.02**
Nontraumatic events	0.07 [0.02]	**<.0009**	0.09 [0.02]	**<.0001**	0.08 [0.02]	**<.0003**
BCOPE+	−0.01 [0.02]	.67	−0.01 [0.02]	.70	−0.00 [0.02]	.92
BCOPE−	0.10 [0.04]	**<.008**	0.12 [0.04]	**<.002**	0.10 [0.04]	**<.006**
RCOPE+	0.01 [0.06]	.87	0.02 [0.06]	.68	0.03 [0.05]	.51
RCOPE−	0.26 [0.13]	**<.04**	0.26 [0.12]	**<.04**	0.28 [0.12]	**<.03**
LOT-R	−0.04 [0.03]	.21	−0.10 [0.03]	**<.0004**	−0.08 [0.03]	**<.003**
CDRISC	−0.01 [0.01]	.43	−0.02 [0.01]	.08	−0.00 [0.01]	.87
SAS-SR	0.68 [0.27]	**<.02**	0.95 [0.26]	**<.0005**	0.90 [0.26]	**<.0009**
NEO Neuroticism	0.06 [0.01]	**<.0001**	0.06 [0.01]	**<.0001**	0.05 [0.01]	**<.0001**
NEO Extraversion	0.01 [0.02]	.77	−0.05 [0.02]	**<.02**	−0.03 [0.02]	.13
NEO Openness	0.03 [0.02]	.07	0.01 [0.02]	.38	0.02 [0.02]	.33
NEO Agreeableness	−0.01 [0.02]	.70	−0.03 [0.02]	.17	−0.03 [0.02]	.17
NEO Conscientiousness	−0.05 [0.02]	**<.006**	−0.05 [0.02]	**<.007**	−0.03 [0.02]	.06
CTQ	0.07 [0.02]	**<.003**	0.08 [0.02]	**<.001**	0.08 [0.02]	**<.0006**

* There are 125 students in the class; 106 completed baseline measures, and 101 completed at least one monthly survey. BAI, Beck Anxiety Inventory; BDI-II, Beck Depression Inventory, version 2; PCL-C, Posttraumatic Stress Disorder Checklist, Civilian version; BCOPE+, Brief Coping Scale, positive coping score; BCOPE−, Brief Coping Scale, negative coping score; RCOPE+, Religious Coping Scale, positive coping score; RCOPE−, Religious Coping Scale, negative coping score; LOT-R, Revised Life Orientation Test; CDRISC, Connor Davidson Resilience Scale; SAS-SR, Social Adjustment Scale, Self-Report version; NEO, NEO Five-Factor Inventory; CTQ, Childhood Trauma Questionnaire; B, standardized regression coefficient; SE, standard error.

† Baseline score is the baseline BAI score, the baseline BDI-II score, or the baseline PCL-C score, depending on the endpoint score analyzed. *P* values in bold are statistically significant.

model we forced baseline BAI, BDI-II, or PLC-C scores as well as the number of traumatic events and the number of nontraumatic events as the first step.

Higher endpoint BAI scores were associated with higher baseline BAI scores (b = 0.52, SE = 0.14, $P < .001$) and with lower NEO Conscientiousness scores (b = −0.06, SE = 0.02, $P < .005$, partial $R^2 = 0.12$, model $R^2 = 0.53$). The effects of traumatic (b = 0.04, SE = 0.06, $P = .54$) and nontraumatic (b = 0.03, SE = 0.03, $P = .31$) event exposure remained nonsignificant (see previous section and Table 4). A second stepwise regression on endpoint BAI scores that only included NEO Conscientiousness scores as a risk factor confirmed these findings.

Higher endpoint BDI-II scores were associated with higher baseline BDI-II scores (b = 0.57, SE = 0.15, $P < .0006$), with higher nontraumatic event exposure (b = 0.05, SE = 0.02, $P < .03$), and with higher CTQ scores (b = 0.09, SE = 0.04, $P < .03$, partial $R^2 = 0.06$, model $R^2 = 0.59$). The effect of traumatic event exposure remained nonsignificant (b = −0.01, SE = 0.05, $P = .91$). A second stepwise regression on endpoint BDI-II scores that included only baseline CTQ scores as a risk factor confirmed these findings.

Higher endpoint PCL-C scores were not associated with higher baseline PLC-C scores (b = 0.17, SE = 0.16, $P = .29$), with traumatic event exposure (b = 0.03, SE = 0.07, $P = .62$), or with nontraumatic event exposure (b = 0.04, SE = 0.03, $P = .18$). Rather, endpoint PCL-C scores were positively associated with higher baseline SAS-SR scores, indicative of poor social functioning (b = 0.91, SE = 0.35, $P < .01$, partial $R^2 = 0.13$, model $R^2 = 0.32$). However, in a second stepwise regression that included only baseline SAS-SR scores as a risk factor, whereas endpoint PCL-C scores continued to be positively associated with these scores (b = 0.57, SE = 0.25, $P < .03$), they were also found to be positively associated with the number of nontraumatic events reported during the year (b = 0.04, SE = 0.02, $P < .04$). This confirms our findings in the previous paragraph.

It should be noted that for students who completed the risk and resilience measures at baseline and endpoint, BCOPE+ ($t_{68} = 2.24$, $P < .03$) and BCOPE− ($t_{68} = 2.14$, $P < .04$) scores increased, and LOT-R scores decreased ($t_{81} = -3.25$, $P < .002$) somewhat during the course of the year. Scores on the other risk and resilience measures (RCOPE+, RCOPE−, CD-RISC, SAS-SR, NEO Neuroticism, NEO Extraversion, NEO Openness, NEO Agreeableness, and NEO Conscientiousness) did not change

significantly during the course of the year.

Endpoint BCOPE+ scores were negatively associated with endpoint BDI-II (b = −0.05, SE = 0.02, $P < .004$) and PCL-C (b = −0.04, SE = 0.02, $P < .03$) scores in separate univariate regressions. Endpoint BCOPE− scores were positively associated with endpoint BAI (b = 0.09, SE = 0.04, $P < .02$), BDI-II (b = 0.10, SE = 0.04, $P < .006$), and PCL-C (b = 0.10, SE = 0.04, $P < .009$) scores. Endpoint LOT-R scores were negatively associated with endpoint BDI-II (b = −0.07, SE = 0.03, $P < .007$) and PCL-C (b = −0.06, SE = 0.03, $P < .02$) scores. However, a repeat of the stepwise regressions described above that included endpoint BCOPE+, BCOPE−, and/or LOT-R rather than baseline scores (where applicable) did not change the findings.

Personal growth

The mean PGI score for students who completed endpoint questionnaires was 41.2 (range 0–104). A multivariate regression including both the number of traumatic events and the number of nontraumatic events reported during the course of the year found that endpoint PGI scores were positively associated with the number of traumatic events reported (b = 0.11, SE = 0.04, $P < .02$) but not with the number of nontraumatic events reported (b = 0.01, SE = 0.02, $P = .70$).

Based on the outcomes of univariate analyses of the association between various risk and resilience factors assessed at baseline and PGI scores assessed at endpoint, only baseline CD-RISC scores were found to be associated with endpoint PGI scores: (b = 0.02, SE = 0.01, $P < .03$). However, in a subsequent stepwise regression, which included the number of traumatic events reported and baseline CD-RISC scores, personal growth at year's end was positively associated with trauma exposure only (b = 0.11, SE = 0.04, $P < .006$, model $R^2 = 0.09$).

We conducted one additional stepwise regression that also included endpoint BCOPE+ and BCOPE− scores, given that these (unlike baseline BCOPE+ and BCOPE− scores) were associated with endpoint PGI scores in a separate univariate regression (BCOPE+: b = −0.04, SE = 0.02, $P < .03$; BCOPE−: b = 0.08, SE = 0.04, $P < .03$). This final stepwise regression showed that higher endpoint PGI scores were associated with both reporting more traumatic events (b = 0.10, SE = 0.04, $P < .02$) and having more positive coping skills at endpoint (b = 0.03, SE = 0.02, $P < .05$, partial $R^2 = 0.04$, model $R^2 = 0.13$).

Discussion

This study prospectively measured medical students' exposure to stressful events during their first year caring for patients. We examined the acute subjective experience of these events as well as their associations with psychological well-being at the end of the year. In addition, we explored individual risk and resilience factors possibly influencing student responses to stressful events.

Events labeled traumatic by students instructed to use DSM-IV trauma criteria were indeed found to involve actual or threatened serious injury or death or a threat to physical integrity (criterion A1) and to elicit an intense emotional response (criterion A2). During the course of the year, students reported, on average, two traumatic events per person. This number approximates *lifetime* rates of trauma exposure among the general American population.[43,44] Whereas 63% of students reported at least one traumatic event (most often during their Internal Medicine or Surgery rotation), students seemed resilient to the psychological effects of trauma exposure during the third year of medical school. In the general population, PTSD occurs in an estimated 9% of those who have experienced trauma.[43,45] In contrast, only 1 of 101 study participants had a PCL-C score indicative of clinically significant PTSD. Although symptoms of posttraumatic stress in our sample initially increased, they tended to decrease again during the latter part of the year (Figure 1). This was mirrored by a decrease in the number of (nontraumatic) events reported and in the level of event-evoked fear over time, which may suggest that students became accustomed to working in the medical system.

Trauma exposure during the year was not significantly associated with psychological well-being at the end of the year. Yet, students who reported more traumatic events experienced more personal growth by year's end. This is consistent with previous literature[41] and might indicate that conscious awareness and/or verbalization of the event might help mitigate its traumatic events. Students' resilience to trauma exposure may be explained in part by the fact that students felt relatively supported by others when talking about these events, especially when they discussed events with medical team members. It is also possible that traumatic events occurring on clerkships are less distressing than traumas occurring outside of the medical setting, both because of the nature of the events (i.e., relatively acute, often passive, perhaps less extreme) and because many events are foreseeable in the context of medical school.

Levels of anxiety and depression in our students, measured using the BAI and the BDI-II, respectively, were comparable with those previously reported in medical and other students.[11,46–49] Although the small increase in depression observed in this sample may not be considered clinically meaningful, endpoint depression was positively associated with the number of nontraumatic events reported during the year. Most of these involved stressful physician–student or physician–patient interactions reflecting, respectively, mistreatment by superiors and poor role modeling; 80% of students reported at least one of these types of events. Nontraumatic events were most often reported when students were on their Internal Medicine, Surgery, or Obstetrics–Gynecology rotations. Importantly, exposure to these nontraumatic events during the year was not associated with personal growth measured at year's end. Instead, exposure to these types of events was associated with higher endpoint BDI-II and PCL-C scores. This suggests that the well-being of students who reported mistreatment by superiors and poor role modeling may have been adversely affected. Previous studies have shown that poor role modeling by physician superiors increases medical student cynicism, decreases empathy, and leads to an unwillingness to care for the chronically ill.[6,50] Our study suggests that poor role modeling may also negatively impact students' personal well-being. This underscores the importance of faculty development in training physicians to be good teachers.

We were surprised to find higher endpoint PCL-C scores associated with having had more stressful events labeled as nontraumatic during the year. The PCL-C is commonly used in patients with PTSD to measure the severity of stress symptoms in response to trauma; thus, we had expected PCL-C scores to be positively associated with the number of traumatic, rather than nontraumatic, events reported during the year. However, the instructions of the PCL-C may be somewhat ambiguous outside of the context of a PTSD diagnosis; the measure asks respondents for problems and complaints that they may be experiencing in response to stressful experiences in general. In our study, the number of nontraumatic events reported during the year was larger than the number of traumatic events reported; thus, the lack of a significant association between traumatic event exposure and PCL-C scores may be attributable to a lack of power. However, it is also possible that stressful events labeled as nontraumatic by students, the majority of which reflected mistreatment by superiors and poor role modeling, did in fact lead to having repeated memories of these events, feeling very upset when reminded of these events, and avoiding thoughts or activities related to these events. In addition, the PCL-C includes several questions relevant to depression, and the observed association between nontraumatic event exposure and endpoint BDI II scores may thus explain the observed association between nontraumatic event exposure and endpoint PCL-C scores.

In our sample, students with a childhood history of trauma were at increased risk for developing symptoms of depression in response to events. On the other hand, students with good social functioning were more resilient to developing stress symptoms in response to these events. These findings may be of interest to medical educators, who might institute early identification of at-risk students and educate them about the importance of social support when dealing with stressful clerkship-related events. Another potentially relevant finding to medical educators was the observed association between reporting personal growth at the end of the year (in response to traumatic event exposure) and positive coping skills assessed at this time point. No such association was observed with positive coping skills assessed at baseline, suggesting that the development of positive coping skills during the year (possibly in response to traumatic event exposure) may have contributed to personal growth seen at year's end. In light of this, it might prove beneficial to teach students who are starting their third-year clerkships how to employ such coping skills (e.g., problem solving and positive reframing) when exposed to traumatic events.

There are some limitations to our study. First, it is likely that there were unreported stressful events, because the majority of students did not complete all monthly surveys. In relation to this, fewer students completed surveys, and survey completers reported fewer events as the year progressed, which could be interpreted as responder fatigue. On the other hand, however, this decline in responding can also be the result of emotional hardening, a phenomenon known to occur in medical students.[51] Second, we instructed students to record events as soon as they occurred, but we collected surveys monthly. Students may have delayed recording events until the end of the month. Still, our study likely resulted in less bias than previous studies, in which students are asked to recall events months or years after their occurrence. Third, the clinical impact of the risk and resilience factors identified as potentially relevant to mental health outcomes at the end of the third year of medical school may be limited for several reasons: (1) the regression model parameter estimates were small and the factors explained only some of the variance in each model (the majority was explained by baseline scores on the three psychological well-being measures), (2) not including additional factors not measured in the study (e.g., substance use, recent life events, family background) may have confounded the regression models, and (3) we did not consider the time of the year that a stressful event occurred, even though it may be expected that events reported later in the year may have had a different impact on endpoint scores on the well-being measures than events reported earlier in the year. Finally, our study was limited to students in one school, and the findings may not generalize to students in other schools.

Conclusions

We found that during the third year of medical school, students are confronted with a substantial number of stressful events. A significant proportion of these were traumatic. Whereas different types of events may have had different effects on psychological well-being, the changes in anxiety, depression, and posttraumatic stress we observed may not have been clinically relevant. Indeed, many students reported personal growth despite repeated exposure to patient suffering and death. Support from others, especially team members, may at least partially explain students' resilience to traumatic events. In contrast, enduring personal mistreatment and observing poor role modeling by superiors may have only adverse effects.

Our research raises several questions that would benefit from further study. How can students, especially those at risk for psychopathology, be better prepared for their first clinical rotations? How can physician superiors be trained such that the negative impact of stressful events to which they subject students are minimized or even prevented? How do the effects of trauma exposure in the third year of medical school compare with effects during internship and residency, when clinical work is much more intense and the responsibility for patient welfare falls squarely in the hands of housestaff? Our findings, and the questions raised by our results, are relevant to medical educators because they underscore the importance of good faculty–student relations and because they may help identify certain risk and resilience factors that could influence the impact of stressful training events for individual students.

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Teaching and Learning Moments

Rationing Empathy

"I lost a 35-year-old woman today." My listener, a middle-aged mother, stops what she is doing and meets my eyes.

"Kids?" she asks. "Two," I answer. My listener looks aghast, looking down momentarily at a child darting past.

"Car accident?" "No—infectious complications of HIV." The bond that tied her to the story loosens its grip. My listener goes a little further to detangle with a common defense. "How'd she get HIV?" "Not sure, but she was an IV drug user." "Kinda did it to herself, huh?"

The last of the bonds fall away.

If there was any connection left, I could have told her that the patient had a dependent personality disorder, and had on more than one occasion blamed her worsening illness on the fact that her family wasn't forcing her to take her antiretroviral therapy. She took no personal responsibility for her condition, and in fact escaped it to the very end through her drug use. Furthermore, she was a difficult person to deal with on many levels—she was frequently not truthful with her doctors, and was often manipulative to her physicians and her family.

My listener moves on, returning to the task that my story had interrupted and leaves me to mourn her passing alone.

I wonder—was she ever valued? Was she loved? Was there a time—even a brief one—where things could have gone differently for her? I will never know. The sadness of her unfulfilled life casts a shadow over me. My listener, now noting my distance, reconnects.

"I don't know how you do what you do," she notes with some pity in her tone.

I know there is great sadness in the world, and my job is in many ways an immersion experience in that sadness. Much like my listener, as a physician I must balance the depth to which I engage that sadness. I see my housestaff attempting this balance as they present a readmission of a patient with acute alcoholic pancreatitis. When I point out that he was a war veteran with depression that he treated with alcohol, my assertion is met with a mix of receptive contemplation and downcast glances; some acknowledge the teaching point, and others choose to observe at a distance. I know I have my limits too. At 3 AM on my third night in a row on call, my sleep interests me far more than the anxiety and poor coping skills of my patient who is nursing the wounds of a recent divorce, and I struggle to remind myself of the lessons I teach my housestaff.

Reflecting on the sadness in others' lives can give us perspective about our own lives, a frame of reference for our struggles, or the joy of sharing in the triumph of the human spirit. It can also, at high doses or inadequate titrations, paralyze us with grief or numb us entirely.

As a physician, I walk that fine line. Connect. Find meaning in the human struggle. Pull out before that struggle paralyzes me. Pull out too early and I become callous; stay in too long and I feel the flames of burnout.

I take another step forward, not sure on which side of the line my foot will land.

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